

over southern Europe and Algeria, and subsequently moved in very similar paths north-northeastward to the Baltic. Of the six areas located on the eastern coast of Asia, three, Nos. II, IX and XIII, occurred during the first portion of the month, and are, from their positions, necessarily poorly defined, as was also No. XIX, which probably passed eastward over Nippon during the night of the 18th. Nos. XXII and XXVI, occurring respectively from the 21st to the 25th, and from the 26th to the 1st of March, were, however, pretty well marked areas, and the general direction of the paths, as well as the positions of the centres, are probably almost correct. The first of these, namely, No. XXII, appears to have developed during the 21st over the China Sea region, on which day the barometers at Hong Kong, Manila and Shanghai, registered the second decided minima of the month. During the 22nd it was followed at Manila and Shanghai by NW. winds, (the only NW. wind of the month reported from the former station,) and moved towards the NE., apparently only a short distance off the coast of Nippon, and thence northward to the Okhotsk Sea. The lowest barometer-readings of the month occurred at the following stations during the passage of this area, and in the order given:

STATIONS.	Date.	Time.		Barometer.		Winds.		
		Local.	Wash. mean.	Inches.	Mm.	(1)	(2)	(3)
Manilla.....	Feb. 1879.							
30° N. 120° E., S. S. Belgic.....	21st	8:47 p. m.	7:55 a. m.	29.80	767.0	SSE.—	SSE.—	NW.
	21st	9:19 p. m.	7:55 a. m.	29.77	766.2	(—) —	SSW.—	(—)
Nagasaki.....	22nd	3:30 p. m.	1:42 a. m.	29.62	762.3	WSW.—	NNW.—	N.
Hiroshima.....	22nd	3:30 p. m.	1:22 a. m.	29.60	761.8	S.—	NNE.—	NW.
Kobe.....	22nd	9:43 p. m.	7:55 a. m.	29.46	758.3	N.—	NE.—	NNE.
Yokohama.....	23rd	11:30 a. m.	9:02 p. m., 22nd	29.05	737.9	N.—	N.—	N.
Tokio.....	23rd	9:30 a. m.	7:02 p. m., 22nd	29.07	738.5	NW.—	NNW.—	NNW.
Nikolaievsk.....	25th	7:00 a. m.	10:07 p. m., 24th	29.40	746.7	W.—	W.—	S.

The wind directions are for the observations at times of lowest barometer (2) and for the same hours of the preceding (1) and succeeding (3) days. At Nagasaki the wind, at 3:30 p. m. of the 21st, was from WSW. as given in table but at 9:10 p. m. it was NE. At Tokio a similar change occurred, the wind at 9:30 a. m. 22nd being NW. and from 3 to 4 p. m. NE; at 3 a. m. 23rd, it veered N. to NNW. and increased to its maximum velocity (29 miles per hour) at 11 a. m.. The heaviest rains of the month were also recorded during the regime of this storm. Nagasaki recording 2.30, Hiroshima, 1.40, Yokohama, 2.96, and Tokio, 3.01 inches. Steamer *Belgie*, from Yokohama to Hong Kong, encountered the storm during the 21st and 22nd; on the latter date she was in 28° 43' N, 125° 34' E. and had barometer 29.85, wind N., force 7 (0-12) with rough, cross and turbulent sea. The area No. XXVI appears to have developed over the interior of China, and to have moved in a path somewhat to the north of Shanghai and the Island of Nippon. The following table gives data for this storm similar to the above:

STATIONS.	Date.	Time.		Barometer.		Winds.		
		Local.	Wash. mean.	Inches.	Mm.	(1)	(2)	(3)
Pekin.....	Feb., 1879.							
Tientsin.....	25th	8:27 p. m.	7:35 a. m.	30.02	762.4	Calm—	SW.—	Calm.
Macao.....	26th	8:32 p. m.	7:35 a. m.	29.95	760.8	E. by N.—	E.—	ENE.
Shanghai.....	26th	8:19 p. m.	7:35 a. m.	29.89	759.2	ENE.—	NE.—	SW.
	27th	2:00 p. m.	12:46 a. m.	29.74	755.4	SE.—	WSW.—	NW.
Manilla.....	26th & 27th	8:47 p. m.	7:35 a. m.	29.52	757.4	SSE.—	ESE.—	SW.
Nagasaki.....	28th	3:30 p. m.	1:42 a. m.	29.64	752.9	SE.—	SE.—	NW.
Hiroshima.....	28th	9:30 p. m.	7:32 a. m.	29.78	756.4	(—) —	N.—	NNW.
Kobe.....	28th	8:47 p. m.	7:35 a. m.	29.91	759.7	ESE.—	SE.—	WNW.
Vladivostok.....	Mar. 1st	7:00 a. m.	5:04 p. m., 28th	29.56	758.3	ESE.—	N.—	Calm.
Yokohama.....	1st	10:00 p. m.	7:35 a. m., 1st	30.03	762.7	S.—	Calm—	NNE.
Tokio.....	2nd	3:30 a. m.	12:52 p. m., 1st	29.92	760.0	SE.—	N.—	NE.
Nikolaievsk.....	2nd	7:00 a. m.	4:18 p. m., 1st	29.54	750.4	Calm—	E.—	Calm.

This area was followed along the coast of China by severe northerly gales and snow. At Tientsin the wind reached a force of 8 (scale 0 to 12); at Tchefow, on the southern coast of the Gulf of Petchely, a violent northerly gale and high tide were experienced; at Shanghai it reached 30 miles per hour at 2 p. m. of the 28th, and at Vladivostok, force 8 (0-12) on the morning of March 1st. From the preceding data the progressive velocities of the centres of these two storms may be estimated at about 25 miles per hour.

In Behring's Sea region high pressures predominated during the greater part of the month, and only three low areas, Nos. II, V and XII, are indicated on the chart. The two former were quite severe storms; the wind at St. Michael's on the 2nd reached 67 miles per hour from the south, and at St. Paul's Island on the 6th, 49 miles from the southeast. After the disappearance of area No. II on the 7th, a decided rise of barometer set in at these stations which continued almost uninterrupted at St. Michael's until 3 p. m. of the 17th, when the barometer read 30.859; at St. Paul's there was a slight interruption on the 10th and 11th, but the pressure recovering, the maximum, 30.679, was reached at 9 p. m., 17th, and 7 a. m. of the 18th; after these dates the barometer fell at both stations until the 22nd. During the regime of this extraordinary high barometer area, northerly winds and gales prevailed and at St. Michael's the temperature fell to -30° on the 18th. After the 22nd lower pressures were experienced with the centre of depression apparently to the southeast of the stations.

TEMPERATURE OF THE AIR.

The mean temperature of the air during October, 1880, is shown by the isothermal lines in red on chart No. II. In the Southern States east of the Mississippi river, and in the Middle States, the

temperature has been near the normal of many years. In all the other districts east of the Rocky Mountains it has averaged from one to five degrees below the normal, the greatest departures being in western Texas and thence northward over Kansas and Colorado. On the Pacific slope the temperature corresponds with the normal, except at San Diego, where it is one degree below, and in the southern Plateau district, where it has averaged over two degrees below. The temperature is slightly above the normal in the lower St. Lawrence valley and Gulf of St. Lawrence.

The following are the maximum and minimum temperatures reported in each State and Territory:

Maximum Temperatures.—*Alabama*: 87° at Montgomery. *Arizona*: 97° at Yuma. *Arkansas*: 82° at Little Rock. *California*: 90° at Visalia, 89° at Los Angeles, 88° at Red Bluff and 100° at Mammoth Tank. *Colorado*: 87° at Trinidad and 79° at Denver. *Connecticut*: 75° at New Haven. *Dakota*: 94° at Fort Randall and 84° at Yankton. *District of Columbia*: 81° at Washington. *Florida*: 90° at Key West and 88° at Punta Rassa. *Georgia*: 88° at Forsyth and 85° at Augusta. *Iowa*: 83° at Fort Madison and 79° at Keokuk. *Idaho*: 85° at Boise City. *Illinois*: 90° at Sterling and 79° at Springfield. *Indiana*: 82° at Vevay and 78° at Indianapolis. *Indian Territory*: 84° at Fort Sill. *Kansas*: 86° at Dodge City. *Kentucky*: 80° at Louisville. *Louisiana*: 92° at Lake Charles and 85° at Shreveport. *Maine*: 72° at Surrey and 71° at Portland. *Maryland*: 81° at Baltimore. *Massachusetts*: 80° at Boston. *Michigan*: 81° at Lansing and Northport, and 76° at Alpena. *Minnesota*: 84° at Breckenridge. *Mississippi*: 89° at Vicksburg. *Missouri*: 83° at St. Louis and Ashley. *Montana*: 81° at Fort Benton. *Nebraska*: 87° at North Platte. *Nevada*: 81° at Winnemucca and 88° at Hot Springs. *New Hampshire*: 73° at Contoocookville and 50° on summit of Mount Washington. *New Jersey*: 83° at Atco and 79° at Barnegat. *New Mexico*: 92° at La Mesilla. *New York*: 84° at Friendship and 81° at Rochester. *North Carolina*: 83° at Charlotte and Wilmington. *Ohio*: 86° at Jacksonburg and 79° at Cleveland. *Oregon*: 86° at Umatilla. *Pennsylvania*: 84° at Egypt and 82° at Philadelphia. *Rhode Island*: 70° at Newport. *South Carolina*: 82° at Charleston. *Tennessee*: 82° at Knoxville. *Texas*: 91° at Rio Grande and 88° at Fort Elliott. *Utah*: 77° at Salt Lake City. *Vermont*: 77° at Charlotte and 72° at Burlington. *Virginia*: 86° at Johnsonstown and 82° at Norfolk. *Washington Territory*: 73° at Olympia. *West Virginia*: 76° at Helvetia and Flemington, and 75° at Morgantown. *Wisconsin*: 77° at Milwaukee. *Wyoming*: 74° at Cheyenne.

Those marked with a star (*) are reported by U. S. Army Post Surgeons or Voluntary Observers.

Minimum Temperatures.—*Alabama*: 38° at Montgomery. *Arkansas*: 32° at Mt. Ida. *Arizona*: 18° at Prescott. *California*: 26° at Campo and 28° at Summit. *Colorado*: —12° on summit of Pike's Peak and 12° at Ft. Garland. *Connecticut*: 30° at New Haven. *Dakota*: 9° at Ft. Stevenson and 12° at Bismarck. *District of Columbia*: 30° at Washington. *Florida*: 40° at Houston and 46° at Jacksonville. *Georgia*: 32° at Gainesville and 39° at Augusta. *Iowa*: 13° at Nora Springs and 22° at Dubuque. *Idaho*: 15° at Ft. Hall and 24° at Boise City. *Illinois*: 17° at Elmira and 26° at Springfield. *Indiana*: 26° at Spiceland and 31° at Indianapolis. *Indian Territory*: 31° at Ft. Sill. *Kansas*: 21° at Holton, Topeka and Yates Centre, and 27° at Dodge City. *Kentucky*: 34° at Louisville. *Louisiana*: 43° at Shreveport. *Maine*: 22° at Cornish, Orono and Gardner and 29° at Eastport. *Maryland*: 23° at Woodstock and 35° at Baltimore. *Massachusetts*: 21° at Rowe, Westborough and Williamstown, and 25° at Springfield. *Michigan*: 24° at Escanaba and Kalamazoo. *Minnesota*: 15° at Breckenridge. *Mississippi*: 40° at Fayette, 43° at Vicksburg. *Missouri*: 25° at Ashley and Corning, 28° at St. Louis. *Montana*: 10° at Virginia City. *Nebraska*: 20° at Genoa and 25° at North Platte and Omaha. *Nevada*: 13° at Winnemucca and 12° at Palisade and Otego. *New Hampshire*: 4° on summit of Mt. Washington and 16° at Grafton. *New Jersey*: 28° at Linden and Somerville, and 30° at Atlantic City. *New Mexico*: 16° at Santa Fe. *New York*: 22° at Argyle and Waterburg, and 29° at Buffalo. *North Carolina*: 26° at Lenoir and Highlands, and 33° at Charlotte. *Ohio*: 21° at Westerville and 29° at Columbus. *Oregon*: 29° at Roseburg and Umatilla. *Pennsylvania*: 22° at Franklin, 30° at Pittsburg. *Rhode Island*: 33° at Newport. *South Carolina*: 45° at Charleston. *Tennessee*: 31° at Knoxville. *Texas*: 26° at Ft. Elliott and 47° at Rio Grande. *Utah*: 27° at Salt Lake City. *Vermont*: 14° at Woodstock and 25° at Burlington. *Virginia*: 23° at Snowville, 31° at Lynchburg. *West Virginia*: 21° at Flemington and 31° at Morgantown. *Wisconsin*: 17° at Neillsville and 26° at Madison. *Wyoming*: 3° at Ft. Bridger and 20° at Cheyenne.

Those marked with a star (*) are reported by U. S. Army Post Surgeons or Voluntary Observers.

Ranges of Temperature at Signal Service Stations.—The monthly ranges will appear from the maxima and minima just given. The greatest daily ranges vary in New England from 18° at Eastport and Wood's Holl to 33° at Boston. Middle Atlantic States, 19° at Chincoteague to 28° at Albany, and 33° at Lynchburg. South Atlantic States, 17° at Cape Lookout to 29° at Charlotte, and 32° at Augusta. East Gulf States, 12° at Key West to 31° at Montgomery. West Gulf States, 18° at New Orleans to 33° at Little Rock. Ohio valley and Tennessee, 24° at Cairo to 35° at Morgantown and Knoxville, and 37° at Pittsburg. Lower Lake region, 21° at Erie to 40° at Rochester. Upper Lake region, 26° at Escanaba, Milwaukee, Grand Haven, Alpena and Port Huron to 29° at Marquette. Upper Mississippi valley, 26° at La Crosse to 33° at St. Louis and 36° at St. Paul. Valley of the Red river of the North, 40° at St. Vincent to 43° at Breckenridge. Lower Missouri valley, 33° at Omaha to 42° at Bismarck. Rio Grande valley, 30° at Eagle Pass to 36° at Rio Grande, and 42°

at Brackettsville. Texas, 27° at San Antonio to 43° at Jacksboro' and Ft. Elliott. Rocky Mountains, 25° on summit of Pike's Peak to 36° at Chyenne, and 39° at Santa Fe. Western Plateau, 29° at Pioche to 37° at Boise City and 50° at Winnemucca. California, 21° at San Francisco, to 38° at Red Bluff and 40° at Visalia.

Frost has been reported very frequently from all sections north of the 35th parallel, but the extreme southern limit is described by a line passing along the southern boarder of Arizona and New Mexico reaching eastward to Concho, Tex., thence deflecting southward to the Rio Grand valley near Brackettsville. From this point it passes eastward to San Antonio and thence directly northward to the southern boundary of Indian Territory. Again deflecting eastward it passes through Vicksburg and between Mobile and Montgomery, reaching the western coast of Florida south of Cedar Keys and the Atlantic coast at Savannah.

Frost, injurious to vegetation, was reported in the various States on the following dates: *Vermont*: 29th. *Massachusetts*: 26th, 28th and 29th. *New York*: 20th and 21st. *New Jersey*: 1st, 14th and 19th. *North Carolina*: 18th, 19th, 24th and 25th. *Tennessee*: 18th. *Ohio*: 18th and 25th. *Michigan*: 28th. *Indiana*: 18th. *Wisconsin*: 13th. *Missouri*: 17th and 18th. *Indian Territory*: 4th. *Kansas*: 17th. *Wyoming Territory*: 10th.

Ground Frozen.—*Oswego*, N. Y., 28th. *Buffalo*, N. Y., 28th. *Bangor*, Me., 25th. *Southington*, Conn., 19th. *Genoa*, Neb., 16th. *Grafton*, N. H., 29th. *Freehold*, N. J., 19th. *Palermo*, N. Y., 28th. *Elsworth*, N. C., 25th. *Cleveland*, O., 18th. *College Hill*, O., 18th. *Wooster*, O., 19th. *Bloomington Grove*, Pa., 22nd. *Charlotte*, Vt., 25th and 29th. *Lanenburg* Vt., 29th. *Neillsville*, Wis., 27th and 31st.

Ice formed in the various States on the following dates:—*Maine*: 14th, 15th, 18th and 25th. *New Hampshire*: 1st, 14th, 25th and 29th. *Massachusetts*: 8th, 9th, 14th and 25th. *Rhode Island and Connecticut*: 25th. *New York*: 1st, 14th, 18th to 21st, 24th to 28th. *New Jersey*: 13th, 17th to 20th, 24th and 25th. *Maryland*: 19th and 25th. *Virginia*: 18th, 19th, 24th and 25th. *West Virginia and Pennsylvania*: 19th. *North Carolina*: 18th, 25th and 26th. *Tennessee*: 23rd. *Ohio*: 7th, 8th, 18th, 19th and 25th. *Indiana*: 18th. *Michigan*: 19th, 24th and 29th. *Illinois*: 17th, 18th, 23rd and 24th. *Missouri*: 4th, 17th, 18th, 19th to 23rd. *Indian Territory*: 17th. *Kansas*: 4th, 5th, 16th to 19th. *Nebraska*: 3rd, 4th, 16th to 19th, 22nd to 24th, 28th to 31st. *Iowa*: 5th, 17th, 18th, 22nd, 23rd, 24th, 28th to 31st. *Wisconsin*: 17th, 18th, 27th, 31st. *Minnesota*: 16th and 17th. *Dakota*: 3rd, 12th and 18th. *Utah*: 10th. *Idaho*: 9th, 10th, 11th, 12th, 15th and 29th. *Washington Territory*: 10th, 11th, 15th and 16th.

PRECIPITATION.

The general distribution of rain-fall, for October, 1880, is shown on chart No. III, as accurately as possible, from about 500 reports. The table on this chart shows the *average* precipitation for October, as compared with that of the present month. East of the Mississippi river, except in the Upper Mississippi valley, Upper Lake region and Middle Atlantic States, where there were slight deficiencies, there were excesses of rain-fall, ranging from 3.36 inches in the Florida peninsula and 2.40 inches in the South Atlantic States to 0.17 in New England. West of the Mississippi, except in Minnesota and the Lower Missouri valley, where slight excesses occurred, the rain-fall was below the average, the greatest deficiency 1.47 inch, occurring in the North Pacific coast region.

Special Heavy Rains.—2nd, Leavenworth, Kan., 2.56 inches in 11 hours 25 minutes; Sterling, Ill., 2.25 in. in 9 hours 30 minutes; Jacksboro, Tex., 4.12 in. 3rd, Jacksonville, 2.25 in. 3rd and 4th, Pt. Pleasant, La., 3.01 in.; Kansas City, Mo., 2.00 in. 3rd to 11th, Mayport, Fla., 15.83 in. 4th, Vicksburg, 2.71 in.; Savannah, 2.24 in. in 7 hours 5 minutes. 7th and 8th, Jacksonville, 4.28 in. in 24 hours; Charleston, 4.50 in. 8th and 9th, Cedar Keys, 4.51 in. 9th, Cape Lookout, N. C., 3.82 in. 9th and 10th, Jacksonville, 4.03 in 20 hours 15 minutes; St. Augustine, Fla., 10.31 in. 13th, near Howard, Neb., 1.38 in. in 50 minutes; Lexington, Mo., 4.32 in. 15th and 16th, Louisville, Ky., 3.23 in.; Louisville, Ill., 2.00 in. in 15 hours; Laconia, Ind., 4.70 in.; Paducah, Ky., 2.37 in. 16th, Toledo, 1.15 in. in 3 hours; Fort Barrancas, Florida, 3.07 in.; Paducah, Ky., 2.92 in. 21st and 22nd, Cedar Keys, Florida, 3.19 in. 25th, Springfield, Illinois, 0.23 in. in 6 minutes. 26th, Fredericksburg, Texas, 2.00 in. 27th, Ft. Barrancas, Florida, 3.62 in.; Helena, Ark., 2.15 in. 27th to 30th, Pt. Pleasant, La., 8.00 in. 28th, Vicksburg, 2.00 in.; Mobile, 2.84 in. 28th and 29th, Wilmington, 2.69 in. in 16 hours; Elsworth, N. C., 6.30 in. 29th, Smithville, 2.51 in. in 10 hours 10 minutes. 29th and 30th, Nashville, 2.30 in. in 25 hours 23 minutes. 30th and 31st, Springfield, Mass., 2.02 in.; Grafton, N. H., 2.45 in., 1.80 in. in 12 hours; Portland, Me., 2.69 in. in 23 hours 45 minutes; Springfield, Mass., 2.24 in. in 20 hours 5 minutes; Burlington, Vt., 2.20 in.; Antrim, N. H., 2.70 in.; Dundee, N. Y., 2.77 in.; Bristol, N. H., 3.04 in.; Lake Village, N. H., 2.97 in.

Largest Monthly Rain-falls.—Mayport, Fla., 20.03 inches; Jacksonville, 16.25; St. Augustine and Paducah, Ky., 14.29; Cape Hatteras, 12.00; Cedar Keys, 10.37; Ft. Barrancas, Fla., 9.78; Charleston, 9.19; Elsworth, N. C., 8.50; Punta Rasa, 8.10; Mt. Washington, 7.96; Cape Lookout, 7.90; Mobile, 7.32; Nashville, 7.24; Laconia, Ind., 7.20; Cairo, 6.96; Smithville, 6.62; Savannah, 6.58; Louisville, 6.39; Evansville, Ind., 6.37; Kittyhawk, 5.95.